PROCEEDINGS

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Faculty of
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PROSPECTS IN MECHANICAL ENGINEERING

8 - 12 September 2008

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L. Lehmann / J. Mämpel

Design of an Adaptive Robot-Gripper

MOTIVATION

Mission is the selection of a gripper-mechanism suitable for a climbing robot. It is part of the InspiRat project, which deals with the development of a climbing robot for inspection and manipulation in cable chutes. At current state of technology there is no climbing robot meeting demands of adaptation to the shape of substratum and a high preservation of substance. For substrate contact, by systematization of grippers in industrial application it is possible to reduce the solution space to flexible finger grippers. Comparison of different types of flexible finger grippers shows that a gripper based on finray-effect is most suitable.

BIOLOGICALLY INSPIRED INTELLIGENT MECHANISM

Finray-effect (Fig. 1) is adapted from the behavior of fish-fins. These do not draw aside lateral forces. The distal ends of the fins oppose those forces. This effect shows no preferred working direction (for details cf. [1]). A gripper based on this effect is „intelligent“, because it is able to adapt to the object surface without any additional control.

DESIGN OF FINRAY-FINGER-GRIPPER

Gripper function is determined by several parameters. Thus it is necessary to set up a mechanical model for the selection of an efficient configuration. The model we realized is able to simulate geometry and forces affecting finray joints. Thus it is possible to check a predefined solution space for adequate configurations (cf. Fig. 2). This is shown for the required climbing challenge. The mechanism may be built up asymmetrically. By this means a preferred working direction is provoked. So it seems possible to make further improvements of the mechanism for gripping requirements.

DESIGN OF FINRAY-FINGER-GRIPPER

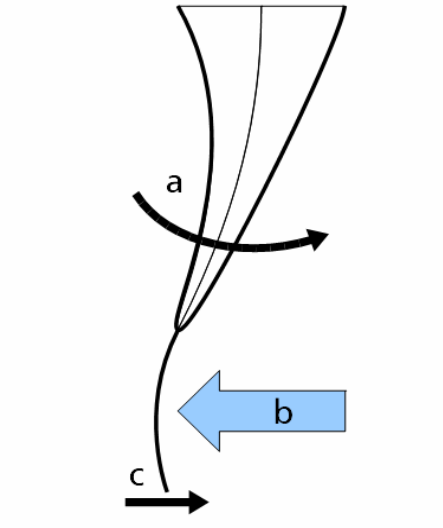

Fig. 1: Finray-Effect: a) flap of fish tail, b) lateral water force, c) opposing movement of distal fin end

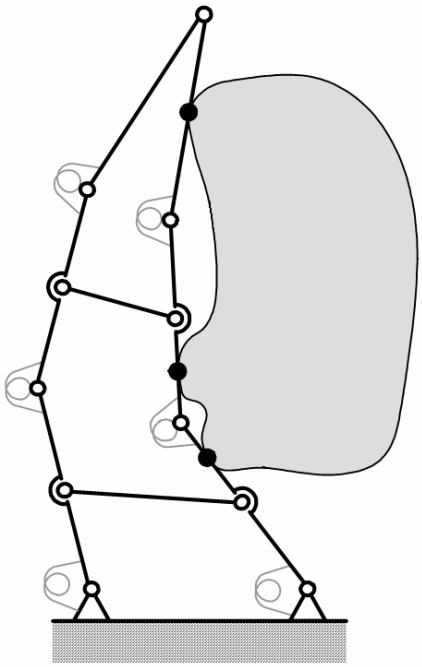

Fig. 2: Finray-Finger (adapted from [1], p. 67)

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The underlying project was granted by BMBF/DLR („InspiRat“ Fkz 01RI0633).

References:

[1] Wegener, Kai: *Ein flexibles Greifsystem für Roboterassistenten im Haushalt.*. Dissertation Universität Stuttgart , Fakultät Maschinenbau, 2007.

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